Video Journal and Encyclopedia of GI Endoscopy (2014) 1, 615-618

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/vjgien

IN THE EXPERT'S FOCUS

Grading the Quality of Bowel Preparation ☆☆

Stijn J.B. Van Weyenberg*

Department of Gastroenterology and Hepatology, VU University Medical Center, De Boelelaan 1118, 1081 HV Amsterdam, The Netherlands

Received 22 January 2013; received in revised form 14 May 2013; accepted 22 May 2013

KEYWORDS
Colonoscopy;
Bowel preparation;
Video

Abstract
In colonoscopy, even a complete examination has little diagnostic accuracy when the endoscopic view of the mucosa was impaired by residual stool. Therefore, an assessment of the visibility of the mucosa is important, in order to be able to judge the reliability of positive, but even more importantly, negative findings during colonoscopy.
Insufficient visualization can result in lesions, especially small or flat ones, being missed. Poor bowel preparation may also result in difficult progression, an increased risk of complications, prolonged procedure duration and an increase in the amount of sedatives and analgetics required. Poor bowel preparation is also a frequent cause for incomplete procedures.
The optimal grading scale uses objective terminology, is validated, and informs both on segmental as overall bowel preparation quality. The Boston bowel preparation scale fulfils all these criteria, making it the most uses bowel preparation scale in colorectal cancer screening programs.

Video related to this article

Video related to this article can be found online at http://dx.doi.org/10.1016/j.vjgien.2013.05.001.

1. Background

- Insufficient mucosal visualization during colonoscopy can result in lesions being missed [1,2].
- Poor bowel preparation may also result in difficult progression, an increase risk of complications, prolonged procedure duration and an increase in the amount of sedatives and analgetics required [3].
- Poor bowel preparation is also a frequent cause for incomplete procedures, resulting in the need for a repeat colonoscopy [3].
- Because of these consequences, the quality of bowel preparation needs to be assessed and documented [4].

2. Materials

- Colonoscope: CF-Q180AL/I Colonoscope, Olympus, Tokyo, Japan.

☆☆The terms of this license also apply to the corresponding video.

*Tel.: +31 20 444 0613; fax: +31 20 444 0554.
E-mail address: sjb.vanweyenberg@vumc.nl

2212-0971
http://dx.doi.org/10.1016/j.vjgien.2013.05.001

- Flushing pump: Aqua:Master executive, Endo-technik, Solingen, Germany.
- Pump – biopsy channel connector: Bioshield irrigator, US Endoscopy, Mentor OH, United States of America.

3. Endoscopic procedure

- The Boston bowel preparation scale is the most extensively validated scale to assess the quality of bowel preparation [5,6].
- In this scale, the colon is divided in three segments: the right side (including cecum and ascending colon), the transverse colon (including the flexures) and the left sided colon, which includes the descending colon, sigmoid and rectum.
- Mucosal view should be scored after cleansing maneuvers like suctioning or washing have been performed.
- For all three sections cleansing is assessed and given a score ranging from 0 to 3.
- In case colon segments are not seen because the procedure is aborted due to inadequate cleansing, these segments are assigned a score of 0.
- The overall score is computed by adding the segmental scores resulting in a score ranging from 0 to 9, where 9 represents the best possible score.

4. Discussion

Insufficient mucosal visualization during colonoscopy can result in relevant lesions being missed. This has been shown in studies on colorectal cancer screening programs, where the adenoma detection rate is directly related to the quality of bowel preparation [2]. It has been suggested that the fact that colonoscopic surveillance does not prevent right-sided cancers is caused by the often worse quality of cleansing of the right side of the colon [7]. Poor bowel preparation can also result in difficult progression, an increased risk of complications, prolonged procedure duration and an increase in the amount of sedatives and analgetics required. Additionally, it is a frequent cause for incomplete procedures or interventions not being performed, resulting in the need for a repeat colonoscopy. Moreover, in screening or surveillance endoscopies, suboptimal bowel cleansing often results in shorter surveillance intervals [8]. These important consequences of inadequate preparation, need to be justified by proper documentation of the preparation quality in the endoscopy report. Many endoscopists describe the quality of bowel preparations in global terms like excellent, good, fair or poor. Usually, these terms are used to describe the overall quality of bowel preparation. Although these terms are widespread, it is not always clear what exactly is meant by these terms and there may be important differences in how these terms are being interpreted and used. Dichotomic descriptions like 'adequate–inadequate' or 'satisfactory–unsatisfactory', are usually used to describe the overall quality of cleansing of the bowel. A potential pitfall with such terms is that they are not solely the result of the mucosal visibility: they also take into account the indication for the investigation. For instance, a poor quality of bowel preparation might be adequate in a colonoscopy performed to investigate bloody diarrhea, but would be inadequate for dysplasia surveillance in a patient with longstanding ulcerative colitis. So, although terms like 'adequate' or 'inadequate' do not describe the cleansing quality in segmental detail or nuances, these terms do answer the fundamental question: has this been a reliable investigation or not? They are therefore complementary to the formal description of mucosal visibility. One of the scales used to evaluate the quality of bowel preparation is the Aronchick scale [9]. This scale grades the adequacy of cleansing of colonic segments or the entire colon, using semi-quantitative descriptors:

- Excellent: Small volume of clear liquid, or greater than 95% of surface seen.
- Good: Large volume of clear liquid covering 5–25% of the surface but greater than 90% of surface seen.
- Fair: Presence of some semi-solid stool that could be suctioned or washed away but greater than 90% of surface seen.
- Poor: Semi-solid stool that could not be suctioned or washed away and less than 90% of surface seen.
- Inadequate: Repreparation needed.

It is often difficult to make estimations of the percentage of mucosa that is visualized, which may impair this score's practical use. Additionally, in many circumstances the presence of semi-solid stool and visualization of $<$90% of the mucosa (which is scored as 'poor'), can be interpreted as 'inadequate' as well. The Ottowa bowel preparation scale is another tool to assess adequacy of colonic cleansing [10]. For calculation of the score, the colon is divided in three segments: the right side (cecum and ascending colon), the mid-section (transverse and descending colon) and the rectosigmoid. For these three segments the following score is applied:

- 0 – Excellent cleanliness: Mucosal detail clearly visible. If fluid is present it is clear. Almost no stool residue.
- 1 – Good: Some turbid fluid or stool residue but mucosal detail is still visible. Washing and suctioning not necessary.
- 2 – Fair: Turbid fluid or stool residue obscuring mucosal detail. However, mucosal detail becomes visible with suctioning. Washing not necessary.
- 3 – Poor: Presence of stool obscuring mucosal detail and contour. However, with suctioning and washing, a reasonable view is obtained.
- 4 – Inadequate: Solid stool obscuring mucosal detail and contour, despite aggressive washing and suctioning.

Besides these segmental scores, an overall assessment of the fluid quantity is made, which results is a score from 0 to 2. The segmental scores and the fluid quantity score are then summed, resulting in an overall score ranging from 0 to 14, where 14 indicates the worst cleansing quality. A drawback is that the score includes the methods used to obtain mucosal view in case of residual bowel content, which may vary considerably between endoscopists. Additionally, the grading of the fluid quantity might be difficult to evaluate, and does not allow for segmental variation.

The Boston bowel preparation scale, which is being demonstrated in the video, is a scoring system, that has an excellent intra- and interobserver reliability, and is proven to be related to endoscopy outcome [5,6]. The colon is divided in three segments: The right side (including cecum and ascending colon), the transverse colon (including the flexures) and the left sided colon, which includes the descending colon, sigmoid and rectum. This score is applied during the withdrawal phase, after cleaning maneuvers have been performed as much as possible. For all three sections cleansing is assessed as follows:

- 0: Unprepared colon segment with mucosa not seen because of solid stool that cannot be cleared.
- 1: Portion of mucosa of the colon segment seen, but other areas of the colon not well seen because of staining, residual stool, and/or opaque liquid.
- 2: Minor amount of residual staining, small fragments of stool and/or opaque liquid, but mucosa of colon segment seen well.
- 3: Entire mucosa of colon segment seen well with no residual staining, small fragments of stool or opaque liquid.

The scores of the individual segments are summed 6resulting in an overall score ranging from 0 to 9, where 9 represents the best possible score. Due to the straightforward terminology, the Boston bowel preparation score is easy to use in daily practice. There is the excellent training program that can be followed online at ⟨www.cori.org/bbps⟩ [11]. In a recent study, segment scores of 2 or 3 had an odds ratio of 1.60 and 2.58, respectively, for polyp detection compared with segment scores of 0 or 1 [6]. A recent study from China showed that in screening colonoscopies BBPS scores ≥ 5 were associated with a higher polyp-detection rate (35%) than scores <5 (18%) [12]. Most likely, the impact of excellent bowel preparation will be even bigger in flat lesions or serrated lesions.

5. Tips and tricks

- Endoscopists should familiarize themselves with at least one of the validated scales to grade the quality of bowel preparation.
- Discussion and video reviewing meetings with faculty and fellows are very helpful in achieving a consistent way grading of bowel preparation quality is performed within a department.
- The online training program of the Boston bowel preparation scale is very helpful in getting started with an excellent validated scale [9].
- Describe the quality of bowel preparation in all colonoscopy reports, and add an interpretation like inadequate or adequate, that takes into account the indication for the investigation.

6. Scripted voiceover

Voiceover Text

Thorough mucosal visualisation is mandatory for reliable colonoscopy and for recommendation of surveillance intervals. Lesions can easily be missed when mucosal view is obscured by residual bowel content. Poor bowel preparation also may result in difficult progression, an increased complication-risk, prolonged procedure duration and an increase in the amount of sedatives and analgetics required. Additionally it often results in repeated procedures, or shorter surveillance intervals being advised. These important consequences need to be justified by proper documentation of the quality of bowel preparation. Documentation should include information on segmental and overall cleansing quality. To achieve this, a validated bowel preparation scale is necessary. The Boston Bowel Preparation Scale is the most commonly used scale.

In this bowel segment, mucosal view is impaired by the presence of air bubbles. Rinsing the bowel wall with a simethicon solution reveals the presence of a 4mm small sessile adenoma.

This is a high-grade flat adenoma in the right-side of the colon, that could easily have been missed with suboptimal bowel preparation. For chromoendoscopy, either with dye application or by electronic image-enhacement or narrow band imaging the bowel should be very well cleansed.

The Boston bowel preparation scale is a segmental and overall cleansing scoring system, with an excellent intra- and interobserver reliability, and is proven to be related to endoscopy outcome. This score is applied for each bowel segment during the withdrawal phase and after cleaning maneuvers have been performed.

This unprepared sigmoid would be scored one. There is solid stool and blood remnants that cannot be washed away, and hamper progression of the endoscope. However, some parts of the mucosa can be seen. If this was not the case, the score would have been zero. If the procedure is aborted due to an inadequate preparation, all non-visualized proximal segments are assigned a score of zero.

In this sigmoid, a small amount of residual staining is seen. However, this can easily be washed away, resulting in the entire mucosa of this segment being seen well. Therefore, the segmental score would be three. If the staining could not have been washed, the score would have been two.

This score is applied to all three bowel segments: The right side (cecum and ascending colon), the transverse colon (including the flexures) and the left sided colon (descending colon, sigmoid and rectum). The segment scores are summed for a total score ranging from 0 to 9. In case colon segments are not seen because the procedure is aborted due to inadequate cleansing, these segments are assigned a score of 0.

In the right side of the colon two small sessile polyps can be seen. Tthere is residual staining and some opaque fluid, especially at the cecum. Washing and suctioning clearly improves mucosal visibility. However, there are still some small portions of the mucosa not entirely seen. Therefore, this segment would be scored 2.

In the mid-section, which includes both the hepatic and splenic flexure, there is some residual staining, which is easily removed by washing. A complete mucosal view is obtained, revealing a small sessile adenoma. This segment scores 3.

In the sigmoid, mucosal view is good. However, there is a small amount of mucus that cannot be removed completely, despite extensive washing and suctioning maneuvers. This segment would therefore obtain a score of 2.

When we sum the segmental scores, we obtain an overall score of 7 out of 9.

Another cleansing scale is the Aronchick scale. This scale grades the adequacy of cleansing of colonic segments or the entire colon, using the semi-quantitative descriptors shown

For calculation of the the Ottowa bowel preparation scale the colon is divided in three segments: the right side (cecum and ascending colon), the mid-section (transverse and descending colon) and the rectosigmoid, and graded using the shown descriptors.

Additionally, an overall assessment of the fluid quantity is made. The segmental scores and the fluid quantity score are then summed, resulting in an overall score ranging from 0 to 14

The consequences on patient management is not incorporated in the BBPS, but should be documented separately, taken into account the indication. For instance, a BBPS of 1 but would be inadequate for surveillance in a patient with serrated adenoma syndrome, but might be satisfactory in a colonoscopy performed to investigate bloody diarrhea in an 18 year old male, as shown here

In conclusion, assessing the quality of bowel preparation and documenting this is an important part of colonoscopy. Optimal view should be achieved by good bowel preparation and best possible perprocedural cleaning maneuvers. The documentation of quality of bowel preparation should contain an objective as possible description of the visibility of the mucosa of the segments of the colon. The consequences on patient management should ideally not be incorporated in the grading itself, but should be documented separately, taken into account the purpose of the colonoscopy. The best validated segmental scale at this moment is the Boston bowel preparation scale, for which an excellent training program is available online at www.cori.org/bbps

Conflict of interest

None to declare

References

[1] Froehlich F, Wietlisbach V, Gonvers JJ, Burnand B, Vader JP. Impact of colonic cleansing on quality and diagnostic yield of colonoscopy: the European Panel of Appropriateness of Gastrointestinal Endoscopy European multicenter study. Gastrointest Endosc 2005;61:378–84.

[2] Chokshi RV, Hovis CE, Hollander T, Early DS, Wang JS. Prevalence of missed adenomas in patients with inadequate bowel preparation on screening colonoscopy. Gastrointest Endosc 2012;75:1197–203.

[3] Burke CA, Church JM. Enhancing the quality of colonoscopy: the importance of bowel purgatives. Gastrointest Endosc 2007;66:565–73.

[4] Rex DK, Petrini JL, Baron TH, Chak A, Cohen J, Deal SE, et al. Quality indicators for colonoscopy. Gastrointest Endosc. 2006;63:S16–28.

[5] Lai EJ, Calderwood AH, Doros G, Fix OK, Jacobson BC. The Boston bowel preparation scale: a valid and reliable instrument for colonoscopy-oriented research. Gastrointest Endosc 2009;69:620–5.

[6] Calderwood AH, Jacobson BC. Comprehensive validation of the Boston Bowel Preparation Scale. Gastrointest Endosc 2010;72:686–92.

[7] Brenner H, Hoffmeister M, Arndt V, Stegmaier C, Altenhofen L, Haug U. Protection from right- and left-sided colorectal neoplasms after colonoscopy: population-based study. J Natl Cancer Inst 2010;102:89–95.

[8] Hillyer GC, Basch CH, Lebwohl B, Basch CE, Kastrinos F, Insel BJ, et al. Shortened surveillance intervals following suboptimal bowel preparation for colonoscopy: results of a national survey. Int J Colorectal Dis 2013;28:73–81.

[9] Aronchick CA, Lipshutz WH, Wright SH, Dufrayne F, Bergman G. A novel tableted purgative for colonoscopic preparation: efficacy and safety comparisons with Colyte and Fleet Phospho-Soda. Gastrointest Endosc 2000;52:346–52.

[10] Rostom A, Jolicoeur E. Validation of a new scale for the assessment of bowel preparation quality. Gastrointest Endosc 2004;59:482–6. (Erratum in: Gastrointest Endosc. 2004;60:326.).

[11] The Boston Bowel Preparation Scale Educational Program. ⟨www.cori.org/bbps⟩ [accessed 21.01.13].

[12] Gao Y, Lin JS, Zhang HD, Lin MX, Cheng CS, Wu SZ. Pilot validation of the Boston Bowel Preparation Scale in China. Dig Endosc 2013;25:167–73.